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ABSTRACT

The study involving 82 hearing and 78 hearing impaired undergraduates was undertaken to test the hypothesis that hearing impaired Ss would cluster prepositions into different sentence groups when operating from scrambled story presentations than would hearing Ss. It was also hypothesized that hearing impaired Ss would show different cluster solutions when operating from scrambled than from canonical story presentations and that hearing Ss would show the same cluster solutions regardless of story presentation. Two conditions of story presentations were utilized--canonical (in which stories were presented to Ss with sentences in normal story order) and scrambled (with sentences randomly ordered). The scrambling of story prepositions was done to remove the salience of the syntactic and causal markers contained in the story prepositions. The scrambling was necessary to devise a more stringent test of the strengths of Ss' narrative schemata than was possible using canonically ordered stories. Findings supported the hypothesis that hearing impaired Ss showed different subjective story structures. Two primary sources for the development of narrative schemata development were also considered. The first primary source was seen to be exposure to stories through listening to them and through reading. A second primary source was noted to reside in knowledge of logic and causation and in the individual's realm of experience that enables him to know how things function generally. It was speculated that hearing impaired children, on the whole, do not share the same set of experiences with either the world, generally, or with narratives, as do their hearing peers. Tables listing story presentations used are included. (SW)

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Narrative Schemata in Hearing-impaired Readers

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meeting of the American Educational
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INTRODUCTION

The development of reading skills in hearing-impaired students remains perhaps the single most pressing problem facing deaf educators (Cornett, Knight, Reynolds, and Williams, 1979). Although reading has been long recognized as an educational priority in the field, attempts to alleviate the deficit in reading achievement have been, for the most part, unsuccessful (c.f. Knight, 1979). Part of this lack of success can be attributed to research that has been primarily concerned with showing a deficit between hearing and deaf readers rather than examining and describing the way in which the two groups approach obtaining meaning from print. Another aspect of this lack of success is that research which has focused on describing how deaf children read has only been capable of being indirectly translated into curriculum strategies.

However, a recent resurgence of interest in the cognitive structures that underlie the processes of comprehending print has provoked a range of investigative thrusts of potential value in studying hearing-impaired readers. One major thrust considers story structure as it relates to text comprehension. This focus has produced a number of story grammars (Glenn, 1978; Mandler & Johnson, 1977) that define the "ideal" organization or the canonical relationship among the propositions contained in a given story. Typically, these grammars are hierarchical in nature with the top levels representing more abstract story information while the lower levels represent more specific story detail. Although the structures derived through story grammars focus on the structure internal to the story but external to the reader, they are assumed to at least partially describe the reader's

internal representation of the story (Cirilo & Foss, 1980).

The internal representation of stories or schemata for narratives represents a second interrelated focus in prose learning. This area of investigation is concerned with the generalized "expectations" or schemata the reader has at his disposal when confronted with printed information (Anderson & Pichert, 1978; Kintsch & van Dijk, 1978; Kluwin, Getson, & Kluwin, 1978; Pollard-Gott, McCloskey, & Todres, 1979). That is, narrative schemata are internal cognitive frameworks that are thought to guide what the reader attends to, encodes, and is subsequently able to retrieve when interacting with print.

Although investigations have demonstrated that story comprehensibility and memorability are affected by the degree of similarity between story structure and reader's narrative schemata (Kintsch, 1977; Thorndyke, 1977), the narrative schemata remain to be fully described. That is, while the story grammars can partially account for these cognitive structures for stories they cannot do so completely (Cirilo and Foss, 1980; Mandler and Johnson, 1977). Also, different grammars define story's and reader's structures along different parameters. How does one decide which description best describes readers narrative schemata? Additional problems are encountered when special populations (e.g. hearing-impaired readers) are of interest as these readers may not share any commonality of story structure with the story grammars. In this situation, the story grammar descriptions of readers' narrative schemata would be questionable, at best.

Clearly, some means of describing reader's narrative schemata <u>independent</u> of story grammars would prove helpful in resolving these questions.

Two recent studies have attempted to derive such a method for empirically determining readers narrative schemata.

First, Pollard-Gott, McCloskey, and Todres (1979) proposed a simple sorting task to describe subjects internal representations for stories (subjective story structure). They had hearing undergraduates read simple narratives and then group the propositions of each story into clusters that formed cohesive story units. The subjects performed the proposition sorting task readily. When the resultant clusters were analyzed through hierarchical cluster analysis it was found that the subjectively defined clusters were generally quite similar to the clusters of propositions representing major story constituents (e.g. Setting, Episodes) that were produced by Mandler and Johnson's (1977) grammar. The authors concluded that the proposition sorting task produced meaningful representations of hearing subject's internal structure that closely approximated the structures produced by the story grammar.

A second study, by Knight and Yekovich (1981), used Pollard-Gott's methodology to test the notion that hearing and deaf subjects have similar cognitive structures for understanding narrative text. They partially replicated the Pollard-Gott study using hearing-impaired undergraduates, predicting that the findings of the Pollard-Gott study would replicate with hearing-impaired subjects. Their findings did show agreement between hearing subjects, hearing-impaired subjects and the theoretical structures regarding the major study constituents. However, differences were found between the ways in which the hearing-impaired subjects structured the propositions <u>within</u> the story constituent boundaries and the ways in which

hearing subjects and the ideal structures did so.

Two explanations can be proffered to account for the different internal structuring of the major story constituents. One explanation would be that the hearing and hearing-impaired subjects possessed narrative schemata that were qualitatively different. That is, while both groups of subjects activated and used narrative schemata to organize incoming information, these schemata were structured differently for the two groups of subjects. As deaf persons have been noted as comprising a sub-culture (c.f. Stokoe, 1976) and culture specific schemata for story comprehension have been reported (Kintsch and Greene, 1978), this explanation is well within the realm of possibility.

A second explanation would be that the differences in internal organization of the major story constituents were artifactual to the way in which the sorting task was applied. That is, the simple canonical structure of the stories coupled with the explicitness of the causal and temporal relations among the story propositions would reduce the likelihood that hearing-impaired subjects were organizing the sorting of propositions through activation of narrative schemata. For example, the sorting task simply required subjects to segment story propositions into groups, from a listing of story propositions sequenced in story order. Frequently, the segmental boundaries of the story constituents were formally cued through linguistic and logical markers that were readily apparent. For instance, in the following sequence:

1. There once was an old farmer.
2. He owned a very stubborn donkey.
3. One evening the farmer wanted to put the donkey in the barn.

readers generally segmented between sentences 2 and 3 because the phrase "One evening" formally signaled the initiation of a new part of the text. While hearing-impaired readers may recognize these syntactic features while sorting the propositions, this recognition does not insure that subjects internally organized the text accordingly. Consequently, the simple sequential nature of the task in combination with certain salient features of the propositions could be responsible for the agreement in episodic boundaries but disagreement in the internal episode structure between hearing and hearing-impaired subjects.

As a consequence of the competing explanations, it cannot be stated with any certainty that subjects were actually activating narrative schemata in completing the proposition sorting task. This reduces the likelihood that the sorting task was meaningful representing the subjective story structures that subjects used when processing narratives. In addition, it reduces the usefulness of the sorting task as a means of describing potential differences in narrative schemata for special populations such as hearing-impaired readers.

One resolution of this problem would be to present story propositions in scrambled story order and then ask hearing-impaired and hearing subjects to sort them into cohesive story units, as before. This approach would show major advantages over the originally cited sorting task. By presenting a story in scrambled order a more thorough processing of story elements would be assured. In the original task, the simple canonical order of propositions precluded the necessity of processing every proposition. Once the formal indicants of story constituents were identified by the sub-

ject, the subject could assume the identity of the intervening propositions.

The disruption of canonical order by scrambling story propositions would, however, prevent the occurrence of this possibility. Although the syntactic and causal markers would still be physically present in story propositions, the story order supporting their ready recognition and use in organizing would not. Consequently, in order for a subject to make use of the information available in these cues, it would be more likely necessary for the subject to activate the cognitive frameworks underlying story interpretation. This activation should then result in descriptions of subjective story structure much closer to the way in which readers actually organize incoming narrative information.

The general evidence cited in literature regarding hearing-impaired readers (c.f. Knight) would reduce (but not eliminate) the likelihood that hearing-impaired subjects would possess the requisite knowledge of syntax and causal markers necessary to re-create ideal constituent structure from scrambled stories. Hearing readers, on the other hand (if activating narrative schema in the originally cited clustering task), should be little bothered by stories presented in scrambled order. That is, hearing subjects should produce essentially the same subjective story structures whether stories are presented in canonical or scrambled order.

METHODOLOGY

Subjects

A total of 82 hearing undergraduates were obtained for the analyses. These students were all from families whose native language was English and either volunteered to participate or participated as part of their class activities.

Hearing-impaired subjects were required to meet three major criteria to be included in the analysis. First, subjects needed to possess a hearing loss in the better ear of 80 dB or greater. Second, subjects needed to have hearing parents. And third, subjects needed to have sustained their hearing loss before age three or prelingually. These criteria defined a sub-population of hearing-impaired students who would most likely possess disrupted cognitive and linguistic development compared to their hearing peers.

A total of 78 undergraduate hearing-impaired subjects were retained for the analyses. These students were all from families whose native language was English and participated in the study as part of their class activities. Analyses of variance for all stories showed non-significant differences between groups for hearing loss.

Materials

The stories used in the study were the same as those reported in Knight and Yekovich (1981) and Pollard-Gott, McCloskey, and Todres (1979): namely, the Farmer, Boy, King, and Peter (short version) stories (see Table

1, 3, 4, 5). The first three stories were derived from folk tales and had well-known structural properties provided by Mandler and Johnson (1977). The last story, the Peter (short version) story, was extracted by Glenn (1978) from a more elaborated Peter story to meet the requisites for minimally well-formed story. The sentences in each story had been edited by Mandler and Johnson or by Glenn to each contain one proposition. Consequently, each sentence contained only one simple story idea.

Two conditions of story presentation were utilized in the study: canonical and scrambled. In the canonical condition, stories were presented to subjects with the sentences in normal story order. In the scrambled condition, stories were presented to subjects with the sentences randomly ordered.

To facilitate the clustering task, sets of cards were prepared. Each set of cards contained one complete story and each card within a given set contained on story sentence. Each set of cards had a code number printed in the upper right hand corner to identify the experimental group and was ordered in either canonical or scrambled order. The sets of cards were compiled into counterbalanced packets for presentation to subjects.

Experimental Approach and Procedure

An overview of the experimental design is provided by Figure 1. The design incorporated two types of subjects (hearing-impaired and hearing), two types of story presentation (canonical and scrambled), and four stories (Farmer, Boy, King, and Peter) in a within subjects format.

Each experimental cell is identified by a code number as detailed in Figure 1. The digits of the code number are broken down as follows:

FIGURE 1.

Experimental Design Overview for the Cluster Task(2)

	Subjects	
Presentation	1. Hearing-impaired	2. Hearing
1. Canonical	1. Farmer (1121) 2. Boy (1122) 3. King (1123) 4. Peter (1124)	1. Farmer (2121) 2. Boy (2122) 3. King (2123) 4. Peter (2124)
2. Scrambled	1. Farmer (1221) 2. Boy (1222) 3. King (1223) 4. Peter (1224)	1. Farmer (2221) 2. Boy (2222) 3. King (2223) 4. Peter (2224)

1. The first digit refers to subjects;
   1 = hearing-impaired, 2 = hearing

2. The second digit refers to story presentation;
   1 = canonical, 2 = scrambled

3. The third digit refers to experimental tasks. In this report, only the 2 = cluster condition is examined (see Reference Note 1);

4. The fourth digit refers to story;
   1 = Farmer, 2 = Boy, 3 = King, 4 = Peter

Instructions were presented to subjects both in writing and through the air (verbally to hearing subjects, in sign language to hearing-impaired subjects). Briefly, the rules for arranging sentences in the cluster task were that in forming the clusters representing cohesive story units:

a. each sentence could be used only once.

b. sentences appearing next to one another in the story list did not necessarily have to be grouped together in the clusters.

c. some sentence groups may contain only one sentence.

d. subjects were free to make as many or as few groups as they wished, but the could not make only one group.

Subjects were then instructed to paperclip together sentences making up a cluster. Examples of clustering were then physically demonstrated.

SUMMARY OF RESULTS

Due to space limitations, only the results for the Farmer story are presented in detail here. These results of the Farmer story are representative of the findings for the other three stories so that little is lost in assuming this abbreviated format.

The hypotheses concerning proposition clustering were:

HC1: hearing-impaired subjects will group story propositions into different story structures in the scrambled condition than will hearing subjects.

HC2: hearing-impaired subjects will group story propositions differently for canonical and scrambled story presentations.

HC3: hearing subjects will group story propositions the same for scrambled and canonical story presentations.

Two types of indices are reported that bear on the level of agreement between the structures produced for corresponding experimental cells: the eyeballing contrasts and the statistical incides of agreement between solutions, Δ and r.

Eyeballing Contrasts

These contrasts compared the tree structure solutions for corresponding experimental cells by examining differencs and similarities in their configuration. The Hierarchical Cluster Analysis (HCA) solutions for the various experimental cells were computed as detailed below.

First, the relatedness score was tallied for each proposition pair by counting the number of subjects that included the pair in a cluster for each story. Second, the resultant relatedness matrix was analyzed by

Hierarchical Cluster Analysis (c.f. Johnson, 1967; Friendly, 1977). The complete-link (diameter) method was employed to derive all cluster solutions.

Third, two statistics were used to evaluate the complete-link solutions. One statistic, Δ, evaluated how well the cluster solutions fit the input data. Δ values below .100 indicate good fits of cluster solution to input data. The second statistic, Z, evaluated whether the sentences in a cluster represented a true cluster or merely a random clustering of elements. The higher the value of $Z_{k,n}$ the better the probability that the sentences formed a true cluster and $Z_{k,n} \geq 4$ was considered significant. However, as $Z_{k,n} \geq 4$ is probably very conservative $3 \leq Z_{k,n} < 4$ were also reported.

Each cluster solution is presented in a Figure and three representations are found on each one. One represents the Hierarchical Cluster Analysis (HCA) solution for hearing-impaired subjects for a given experimental cell. The second represents the HCA solution for hearing subjects for the corresponding experimental cell and is displayed as a mirror-image to the first solution to facilitate comparison. The third represents the story grammar structuring of the story propositions.

The Y-axis represents the percentage of subjects clustering a given sentence pair and the X-axis represents the sentence number (see Figure 2a). Thus in Figure 2a, 90% of the hearing-impaired subjects clustered sentences 1 and 2, 95% clustered sentences 6 and 7, and so on. An "*" on a bridge indicates that the sentences linked by the bridge clustered at a $Z_{ij} \geq 4.000$. A "+" in the same position indicates that $3.00 \geq Z_{ij} < 4.000$. Thus, in Figure 2a, sentence 4 clustered with sentences 6, 7 at $3.00 \geq$

$z_{ij} < 4.000$ and sentence 5 clustered with sentences, 4, 6, 7 with $z_{ij} \geq 4.000$, and so on.

Statistical Indices of HCA Solution Agreement

While the previous contrasts focused on comparing HCA solutions by eyeballing their graphic representations, these indices compare the degree of similarity between solutions through statistical quantification. Two indices were used for this analysis.

First, Delta values were computed that indexed how well one solution fit another solution. Second, Pearson product-movement correlations between the U-matrices of comparative groups were computed. The U-matrices contain the values at which each proposition pair was first clustered in the HCA solution. As Delta values are inversely proportional to goodness of fit, agreement between Delta and r is also inversely proportional. That is, as Delta values decrease r values should increase if both indices are in agreement. As the Pearson r's are sensitive to the directionality of differences between two matrices while Delta is sensitive only to the magnitude of difference, perfect agreement between the two indices cannot always be expected to obtain. The Delta values and Pearson r's comparing solutions for hearing-impaired and hearing subjects by corresponding experimental cell are provided in the text.

Farmer Story

Hearing-impaired and Hearing, Canonical Presentation (1121 and 2121). The graphic representations of the HCA solutions for cells 1121 and 2121 are given in Figure 2a. The Delta values indicated excellent fits for

FIGURE 2a.

HCA Solutions for Canonical Presentation
for Hearing-impaired and Hearing subjects
for the Farmer Story

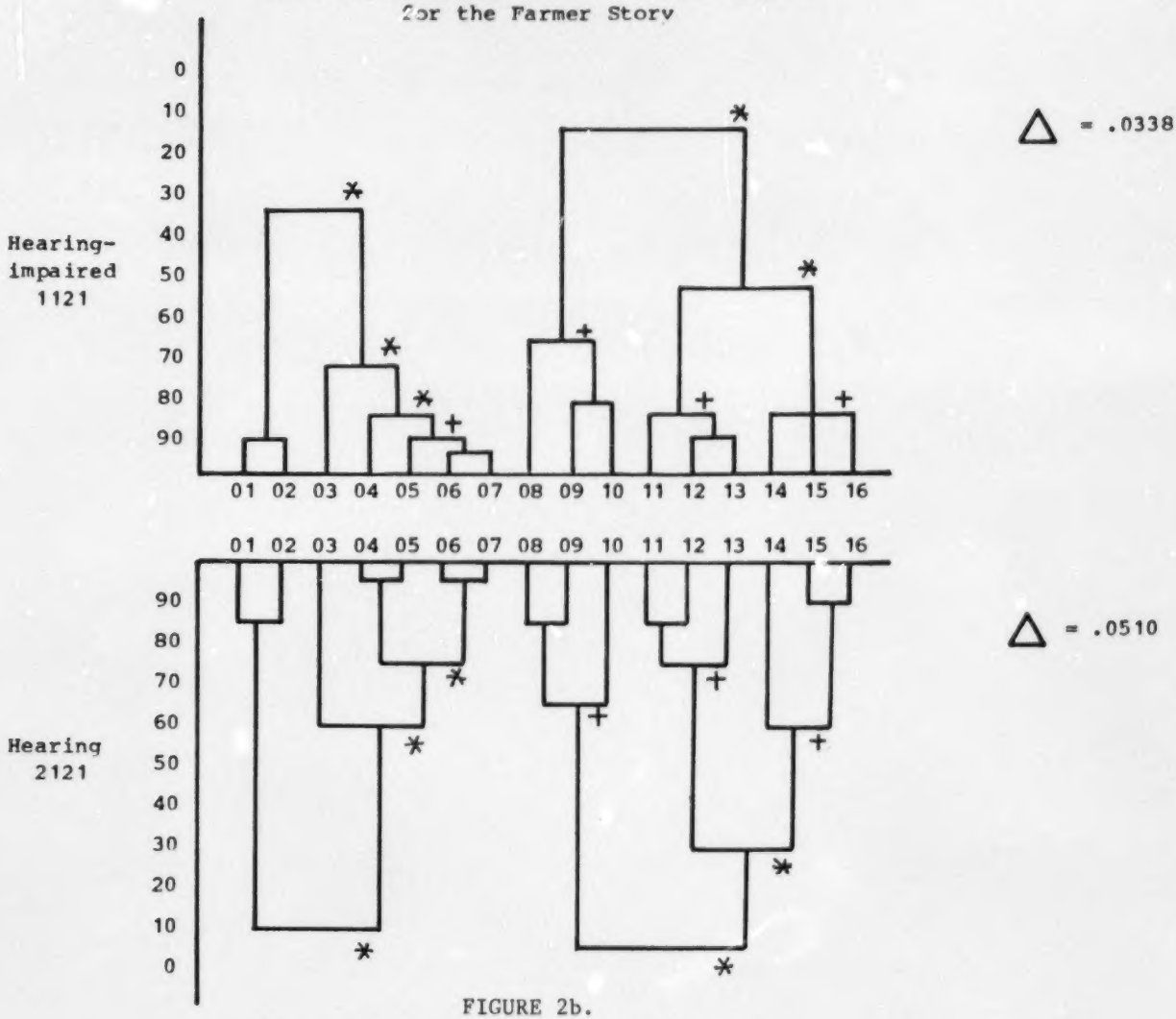
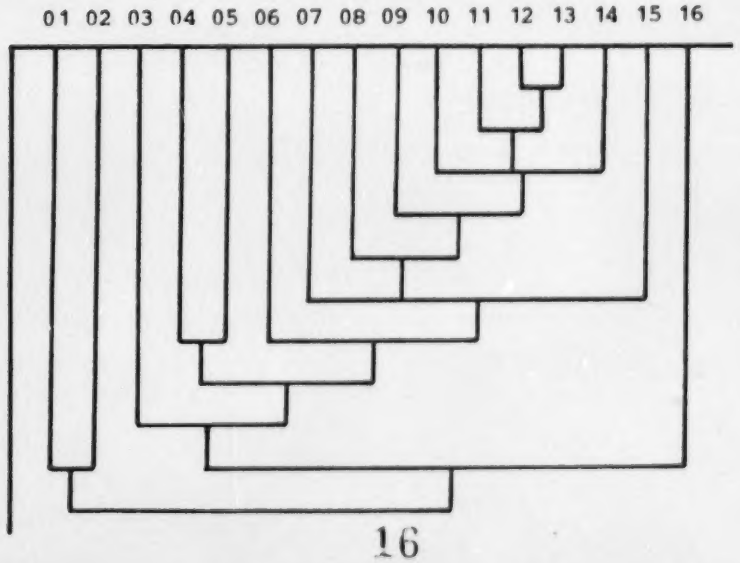


FIGURE 2b.

Mandler and Johnson's (1977) Tree
Structure for the Farmer Story



both solutions and the $Z_{k,n}$ values indicated stable solutions and were comparable for both cells. The sentences for the Farmer story are listed in Table 1 in canonical order. Note the changes in proposition order in the HCA solutions for hearing-impaired subjects (...3, 5, 4...) and for hearing subjects (...4, 6, 5...).

The two HCA solutions appear to be quite similar. Both hearing and hearing-impaired subjects produced three major episodes for the Farmer story: sentences 1-7 describe the setting and the farmer's initial attempts to get the donkey in the barn, sentences 8-10 describe a second attempt involving the dog, and sentences 11-16 describe a final successful attempt involving the dog and cat. In addition, the setting information (sentences 1 and 2) was set off within the initial episode by both groups of subjects. While both solutions differed in some respects from the theoretical structure in Figure 2b, they both displayed a right branching tendency consistent with the Mandler and Johnson structure.

Although the major episodes agreed between the two groups, the internal structuring of the episodes differed. That is, the sentences within each of the three major episodes were paired differently by hearing than by hearing-impaired subjects. This finding is consistent with that reported by Knight and Yekovich (1981). For example, in the first episode hearing subjects clustered 1 with 2, 4 with 6, and 5 with 7; 4, 6 with 5, 7; 3 with 4, 6, 5, 7; 1, 2 with 3, 4, 6, 5, 7. Hearing-impaired subjects, on the other hand, clustered 1 with 2, and 6 with 7; 4 with 6, 7; 5 with 4, 6, 7; 3 with

TABLE 1.

Farmer Story (Canonical)*

1. There was an old farmer.
2. He owned a very stubborn donkey.
3. One evening the farmer wanted to put his donkey into the barn.
4. First he pushed him.
5. The donkey would not move.
6. Then he pulled him.
7. The donkey still would not move.
8. Next the farmer thought he could frighten the donkey into the barn.
9. So he asked his dog to bark at the donkey.
10. The lazy animal refused.
11. Then the farmer thought that his cat could get the dog to bark.
12. So he asked the cat to scratch the dog.
13. The cooperative cat scratched the dog.
14. The dog immediately began to bark.
15. The barking frightened the donkey.
16. The donkey jumped into the barn.

*Sentence numbers are included here to facilitate referencing from the text. Sentence numbers were not included in the experimental materials.

5, 4, 6, 7; and 1, 2 with 3, 5, 4, 6, 7. Similar structural differences were evident for the remaining two episodes between hearing and hearing-impaired subjects. Medium level agreement was shown between the solutions for cells 1121 and 2121 and was quantified as Δ = .1705 and r = .9323.

Hearing-impaired and Hearing, Scrambled Presentation (1221 and 2221). The solutions for cells 1221 and 2221 are displayed in Figure 3a. The Delta values for both solutions indicated very good fits and the $Z_{k,n}$ values indicated stable solutions and were comparable for both cells. The Farmer story in scrambled order is listed in Table 2. Note the changes in sentence order in the HCA solutions for hearing-impaired subjects (...3, 5, 4...7, 10, 11...14, 8, 9, 15) and for hearing subjects (...4, 6, 5...).

The hearing subjects, clustering sentences into cohesive story units from scrambled story stimuli, produced a solution very similar to that reported for hearing subjects clustering from the canonical presentation (2121). Again, the solution here indicated three major episodes encompassing sentences 1-7, 8-10, and 11-16. The internal structuring of these episodes was identical except that in the final episode sentences 11, 12 clustered with 13, 14 instead of 13 clustering with 11, 12 as in the previous case. Also, the solution displayed a right branching tendency as before. It would not appear that the scrambled presentation of story much affected hearing subjects clustering strategies for the Farmer story. This interpretation statistically supported by the Δ = .0993 and r = .9514 for cells 2121 and 2221.

The hearing-impaired subjects, however, produced a markedly dissimilar solution under the scrambled condition of presentation. Two major episodes

FIGURE 3a.

HCA Solutions for the Scrambled Presentation for Hearing-impaired and Hearing Subjects for the Farmer Story

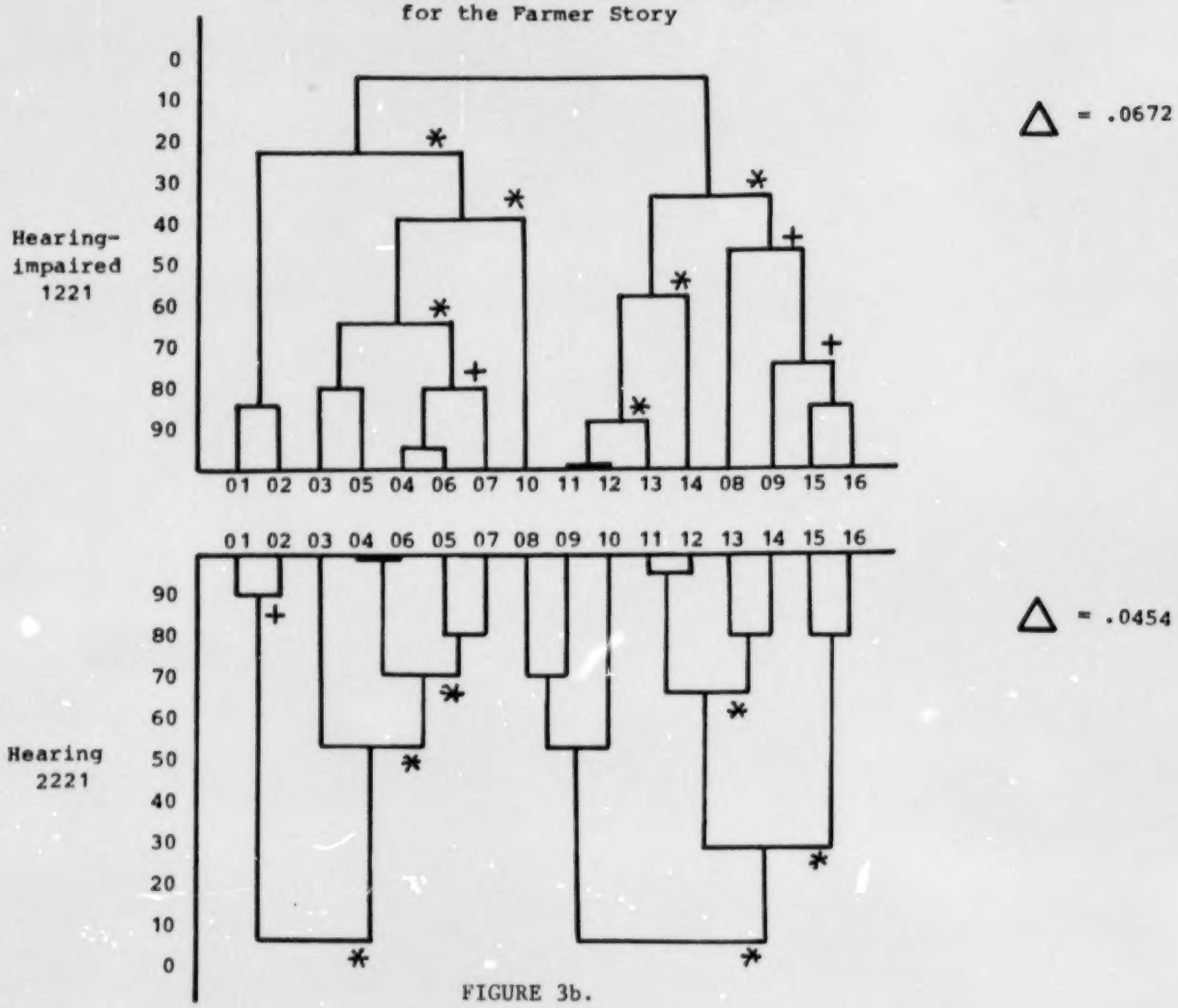


FIGURE 3b.

Mandler and Johnson's (1977) Tree Structure for the Farmer Story

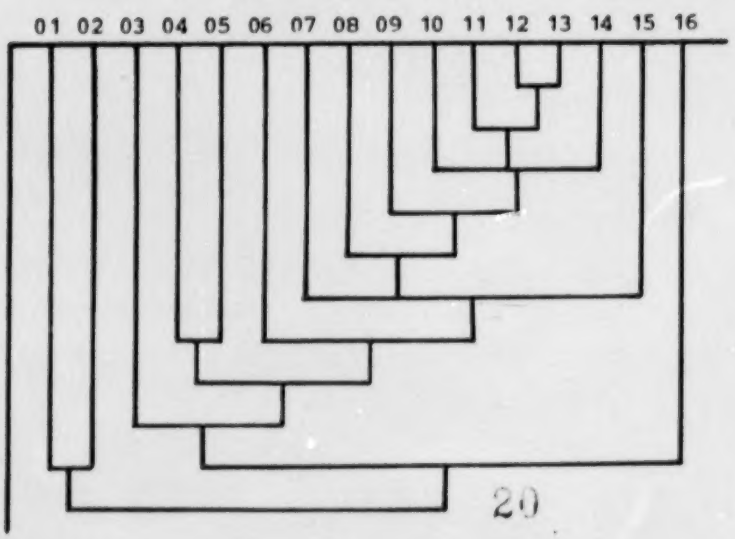


TABLE 2.

Farmer Story (Scrambled)

The donkey would not move.

Then he pulled him.

Then the farmer thought that his cat could get the dog to bark.

First he pushed him.

The cooperative cat scratched the dog.

The dog immediately began to bark.

So he asked the cat to scratch the dog.

The donkey still would not move.

So he asked his dog to bark at the donkey.

The lazy animal refused.

He owned a very stubborn donkey.

There once was an old farmer.

One evening the farmer wanted to put his donkey into the barn.

The barking frightened the donkey.

The donkey jumped into the barn.

Next the farmer thought he could frighten the donkey into the barn.

were evidenced in the HCA solution: sentences 1-7, 10; and 11-14, 8, 9, 15-16. The first episode here was comparable with the first episode in the previous section except that it included sentence 10 ("The lazy animal refused."). Sentence 10 referred to the dog in the solutions for cells 1121, 2121, and 2221 but here (cell 1221) it referred to the donkey. The setting cluster (1,2) linked to the remainder of the first episode as in the previous solutions. However, the internal structuring of the remainder of the episode (sentence 3-7, 10) is different from that in the previous solutions.

The second major episode for cell 1221 combined elements of the second and third episodes from the previous solutions. That is, sentences 8, 9, that in the previous solutions were placed in the second episode (8, 9, 10), were placed in the final episode for the solution to cell 1221 (11-14, 8, 9, 15-16). The scrambled solution appeared quite different from the canonical solution for hearing-impaired subjects.

The eyeballing comparison for solutions for the Farmer story has pointed out some major structural shifts for hearing-impaired subjects clustering from the scrambled presentation condition. The statistical indices of agreement supported this observation. The solutions to cells 1221 and 2221 (Δ = .2473; r = .8614) were less similar than the solutions to 1221 and 2121. Also, the solutions for hearing-impaired subjects between canonical (1121) and scrambled presentations (1221) showed considerably less agreement (Δ = .2301; r = .8543) than for hearing subjects (2121 with 2221 Δ = .0993; r = .9514).

Summary of Contrasts for the Farmer Story. Regarding HCl, one would

expect that the eyeballing contrasts and the statistical indices of solution agreement would show greater differences between hearing-impaired and hearing subjects for solutions from the scrambled than from the canonical presentations. The findings reported regarding the Farmer story met this expectation quite well. That is, the HCA solutions for hearing-impaired and hearing subjects showed closer agreement for canonical than for scrambled presentations for both the eyeballing contrasts and the statistical indices of agreement.

In the eyeballing contrasts, differences both in the episodic structure and in the internal structuring of the episodes were noted for the scrambled solutions between hearing-impaired and hearing subjects. The statistical indices of agreement for solutions between hearing-impaired and hearing subjects for corresponding cells showed Delta values higher (meaning poorer fits) for the scrambled contrasts (1221 with 2221) than for the canonical ones (1121 with 2121). The reported r's also supported this trend.

Turning to HC2 and HC3 one would expect that the eyeballing contrasts and the statistical indices would show greater agreement between the canonical and scrambled cell solutions for hearing than for hearing-impaired subjects. Again, the findings met this expectation quite well.

In the eyeballing contrasts, the similarities between the canonical and scrambled solutions for hearing subjects were much more evident than the differences. The contrasts between the canonical and the scrambled solutions for hearing-impaired subjects showed much greater differences, however. Differences in both episodic structure and in the internal struc-

turing of episodes were noted between the canonical and scrambled solutions. The statistical indices of agreement closely mirrored the findings of the eyeballing contrasts.

In summary, the evidence brought to bear in this section provides strong support for HC1, HC2, and HC3 for the Farmer story. Hearing-impaired subjects produced scrambled solutions representing subjective story structures that were different than those scrambled solutions for hearing subjects or the canonical solutions for hearing-impaired subjects.

Boy, King, and Peter Stories

The results for the Farmer story were duplicated for both the Boy and King stories. That is, in each case those stories showed pronounced differences when clustered under the scrambled condition by hearing-impaired subjects compared to the other conditions. While the solution to the Farmer story under the hearing-impaired scrambled condition altered the definition of episodes (i.e. two major episodes rather than three), this did not occur in the Boy and King stories. Rather, the Boy and King solutions approximated eposodic boundaries but restructured the internal organization of the story episodes. These restructurings included the interchanging of sentences from one episode to another.

The Peter story results, supported HC1 and HC2 but did not HC3. That is, hearing subjects showed different subjective structures between the canonical and scrambled conditions. These findings ran counter to HC3 and the findings from the other three stories regarding to HC3. The findings for the Peter story did support HC1 and HC2, however.

DISCUSSION

In this experiment, hearing-impaired and hearing subjects sorted sentences from stories presented in canonical and scrambled order, into cohesive story units. It was hypothesized that hearing-impaired subjects would cluster propositions into different sentence groups when operating from scrambled story presentations than would hearing subjects. It was also hypothesized that hearing-impaired subjects would show different cluster solutions when operating from scrambled than from canonical story presentations. Further, it was hypothesized that hearing subjects would show the same cluster solutions regardless of story presentation.

The relationship between the hypotheses just expressed and the scrambled condition of presentation needs to be reviewed here. Briefly, the scrambling of story propositions was done to remove the surface salience of the syntactic and causal markers contained in the story propositions. This scrambling was necessary to devise a more stringent test of the strength of subjects' narrative schemata than was possible using canonically ordered stories. If, for example, subjects were clustering story propositions based on surface features of syntax and causality as suggested in Knight and Yekovich (1981) then these clusterings would be influenced when the salience of those features was removed (as with scrambling the story propositions). If, however, subjects were clustering stories from a deeper internal framework that incorporated not only the surface syntactic and causal markers, but notions of story structural features as well, then

these clusterings would not be influenced by the removal of the salience of the surface features to nearly the same degree. That is, if subjects were clustering story propositions by activating their narrative schema, then the removal of the salience of syntactic and causal markers should influence these clusterings very little. However, whatever the case, the truer test of subjects' narrative schemata lies in the use of scrambled stories because subjects are forced to activate deeper notions of story structure when clustering than when exposed to canonically ordered stories.

The findings summarized in the results section established support for the hypotheses that hearing-impaired subjects would show different subjective story structures. However, the reasons for these differences have not been fully explored. That is, why should hearing-impaired subjects have different notions of story structure than their hearing counterparts?

Part of the answer may lie in the way in which narrative schemata develop. Mandler and Johnson (1977) list two primary sources for the development of these schemata.

The first primary source for constructing narrative schemata is exposure to stories through listening to them and through reading. As children gain experience with stories they induce the principles by which stories are typically organized. This information includes how stories are arranged and how story constituents are typically sequenced to convey information efficiently and intelligibly. Frequently, children's first exposure to stories occurs in the home with the caretakers being the prime instigators and with television and other children and adults close to the child playing a secondary, though important role.

A second primary source used to construct narrative schemata resides in people's knowledge of logic and causation and in people's realm of experience that enables them to know how things function generally. However, knowledge of logic and causation must frequently be adapted or specialized as the formal principles of logic and cause and effect are not always followed by narratives (e.g., fairy tales). The factors contributing to this knowledge base are cultural experiences and factors, general life experiences, and educational and other institutionally related experiences.

People's general world knowledge, then, coupled with more specialized experiences with narratives, enables them to evolve a framework or prototypic set of expectations regarding the content and relationships between characters and events common to narratives. These schemata for narratives then serve to focus what the reader attends to, how the reader encodes story content, and what the reader is able to retrieve subsequent to the act of reading.

Hearing-impaired children, on the whole, do not share the same set of experiences with either the world, generally, or with narratives, as do their hearing peers. The hearing-impaired subjects in this study represent a subset of the hearing-impaired population that would be even less likely to share those experiences.

First, all hearing-impaired subjects in this study had an 80 dB or greater, in the better ear. Consequently, all subjects possessed a very severe to profound hearing loss. Secondly, all hearing-impaired subjects were deafened before the age of three. Prelingually deafened children

typically experience more severe academic and English language problems than post-lingually deafened children. Third, all hearing-impaired subjects in the study had hearing parents. Hearing-impaired children of hearing parents are less likely to establish normal parent-child communication patterns than hearing-impaired children of hearing-impaired parents.

As a consequence of these characteristics, the hearing-impaired subjects in this study would be unlikely to have an experiential base for constructing narrative schemata that would be similar to the experiential base of the hearing subjects. For example, the lack of normal parent-child communication patterns would reduce the child's exposure to stories. Also, profound and prelingual deafness frequently results in the child being institutionalized at an early age rather than attending a local day program and living at home. This too would tend to reduce a child's exposure to stories or at least change the nature of that exposure. Many other facets of the deaf child's life would show similar experiential differences. Given these experiential differences, how should the narrative schemata of hearing-impaired subjects differ from those of their hearing counterparts?

One level of difference would be that hearing-impaired subjects possess immature expectations for story that employ only rudimentary knowledge of narratives and that serve to structure the reading process in a basically capricious fashion. Using Mandler and Johnson's (1977) terminology, stories organized under these schemata could not be easily or consistently parsed into Setting and Event Structures. If this is the case, then hearing-impaired subjects should produce subjective story structures that

differ from those of hearing subjects in inconsistent ways. That is, these schemata would organize stories in ways that on the surface appeared random and/or non-sensical.

Another level of difference would be that hearing-impaired subjects possess narrative schemata that function to organize the reading process, but do so in ways dissimilar to hearing subjects. That is, the Setting, Event Structures, and Episodes are present and serve to organize stories but are defined and are interrelated on different bases in hearing-impaired than in hearing subjects. If this is the case, then hearing-impaired subjects should produce subjective story structures that define constituent boundaries differently and alter top level episodic structure compared to hearing subjective story structures.

A third level of difference would be that hearing-impaired subjects posses narrative schemata that organize stories at the top levels in basically the same fashion as do the narrative schemata of hearing subjects. That is, stories are comprised of sets of propositions that describe the Setting, Event Structure, and the Episodes making up the Event Structure. Further, these constituents are defined in basically the same way in the narrative schemata of hearing and hearing-impaired subjects. However, these schemata organize the subcomponents of the Episodes differently and assign story propositions different functions for hearing-impaired than for hearing subjects. If this is the case, then the subjective structures of hearing-impaired subjects should show different internal organization of Episodes and show shifts in the functions certain propositions play within the constraints of that episode.

While the results presented earlier showed differences in subjective story structures to exist between hearing-impaired and hearing subjects realization of these differences at the propositional level remains to be made in terms of the preceeding discussion. A review of the differences pointed out in the preceding section for the solutions derived under the scrambled conditions should prove helpful.

Farmer Story.

The reader is referred to Table 1 for a canonical listing of the Farmer story and to Figure 3a for the HCA solution to cell 1221. Additionally, the reader may wish to review the sub-section for scrambled solutions under the Farmer story.

Briefly, the major differences accorded the scrambled solution to the Farmer story for hearing impaired subjects were that sentence 10 ("The animal refused") attached to the first episode and sentences 8, 9 attached to sentences 11-16 in the final episode. Also, the cell 1221 solution showed two major episodes (1-7, 10, and 11-14, 8, 9, 15-16) while the solutions to all the other cells for the Farmer story indicated three major episodes (17; 8-10; 11-16).

At the proposition level, the changes in canonical order suggested by the solution to cell 1221 for the first episode were:

1. There was an old farmer.
2. He owned a very stubborn donkey.
3. One evening the farmer wanted to put his donkey into the barn.
5. The donkey would not move.
4. First he pushed him.
6. Then he pulled him.
7. The donkey still would not move.
10. The lazy animal refused.

In the order that the sentences appeared in the solution, the second episode for cell 1221 read:

11. Then the farmer thought that his cat could get the dog to bark.
12. So he asked the cat to scratch the dog.
13. The cooperative cat scratched the dog.
14. The dog immediately began to bark.
8. Next he thought he could frighten the donkey into the barn.
9. So he asked his dog to bark at the donkey.
15. The barking frightened the donkey.
16. The donkey jumped into the barn.

The overall meaning of the first episode remained relatively intact in the solution to cell 1221. That is, the first episode indicated that a farmer wanted to get a donkey into the barn but the donkey would not cooperate. However, differences in the traits of the characters in the story were indicated. That is, in the first episode for cell 1221 the "lazy animal" referred to the donkey rather than the dog, as a canonical ordering of the story would dictate. The donkey then became not only "stubborn" (as in sentence 2) but "lazy" as well. The traits of the dog, however, were never made explicit.

In the second episode for cell 1221, a similar situation existed. Again, the global meaning remained relatively intact. That is, the final episode describes how the donkey was finally put into the barn.

However, the means used to achieve the donkey's entry into the barn are quite different. That is, sentences 11, 12, 13, and 14 formed a sub-episode describing the feasibility of using the cat to get the dog to bark. The second sub-episode, sentences 8, 9, 15, 16, described how the dog barking was put to use to accomplish getting the donkey in the barn. The role of the dog was changed from preventing the success of the farmer's

second attempt to get the donkey into the barn, as in the canonical version, to one of implicit cooperation in promoting the success of the final attempt.

This final episode for cell 1221, then, is in contrast to the second and third episodes in cells 1121, 2121, and 2221. In those solutions, the second episode (8, 9, 10) described an attempt that failed because the dog was too lazy to bark. Then, the final episode, sentences 11-16, described how the cat was used to get the dog to bark in order to finally scare the donkey into the barn.

These differences, while not unduly disrupting the global story intent, do restructure story episodes and redefine story characters and relationships. The differences do not appear to be capricious or random. Rather, in each case where differences occurred they made sense and could be interpreted within the context of the story parameters.

Although only the Farmer story was examined here the differences displayed by hearing-impaired subjects in the subjective story structures for all four stories (Farmer, boy, king, and Peter) reorganized major story constituents and redefined characterizations and relationships well within general story the story context and were not random or disruptive to story cohesive.

This analysis adds to the evidence that hearing-impaired subjects activated narrative schema while clustering propositions from scrambled stories. The fact that the schema are not only different but reasonable within the story context argues strongly that it was narrative schema, and not some other organizational framework, being utilized by the hearing-

impaired subjects when clustering the scrambled stories.

The review of the subjective story structures and the accompanying discussion provide strong support for the level of differences residing primarily at the third level discussed earlier; namely, the different organization of episodes and the redefinition of proposition functions. All four stories exhibited clear differences at this level of organization. In addition, the Farmer story did show differences in story organization that reflected the second level of difference. That is, the Farmer story for hearing-impaired subjects under the scrambled condition contained two major episodes rather than three. Consequently, some evidence supported the notion that hearing-impaired subjects may have a different concept of an episode as if relates to the overall organization of the story as well as a different notion of the internal organization of the episode.

In summary, while the Setting and/or Event structures were altered to some extent in every story, these restructurings did little to change global story intent. The restructuring of the Episodes, however, did produce pronounced differences in sentence function and in story detail lower in the story organization.

The results of the study have both practical and theoretical implications. The practical implications relate primarily to instructional and test development strategies that would incorporate hearing-impaired readers differences in orientation to narratives. The theoretical implications relate to the evidence in support of the universality of narrative schemata in the reading process and how a different cognitive organization for hearing-impaired subjects may interact with other factors of reading abi-

lity to affect story comprehension and recall.

The major conclusion to be reached from the evidence presented in this study is that hearing-impaired readers possess narrative schemata that result in the organization of narrative constituents in a fashion qualitatively different from those of their hearing counterparts. Further, these schemata, while restructuring story constituents and redefining relationships between story propositions, organize narratives in meaningful and plausible ways.

Reference Notes

1. In the original experiment two experimental tasks were also employed: sorting sentences into the best story order and clustering. This report however, details only the clustering aspect of the original experiment as it showed the most provocative results. Hence, the use of a four digit code number in Figure 1 was originally necessary to account for all conditions. A copy of the full report may be obtained from the author, CSEHD KDES, Gallaudet College, Kendall Green, Washington, DC 20002.

REFERENCES

Anderson, R.C., and Pichert, J.W. Recall of previously unrecallable information following a shift in perspective. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 1-12.

Cirilo, R.K. & Foss, D.J. Text structure and reading time for sentences. Journal of Verbal Learning and Verbal Behavior, 1980, 19, 96-109.

Cornett, O., Knight, D., Reynolds, H., & Williams, C. A theoretical model of the development of reading in hearing impaired children. Directions, 1979, 1, 43-68.

Friendly, M.L. In search of the m-gram: the structure of organization in free recall. Cognitive Psychology, 1977, 9, 229-247.

Glenn, C.G. The role of episodic structure and story length in children's recall of simple stories. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 229-254.

Johnson, S.C. Hierarchical clustering schemes. Psyckometrika, 1967, 32, 241-254.

Kintsch, W. On comprehending stories. In M. Just & P. Carpenter (Eds.), Cognitive Processes in Comprehension, Hillsdale, NJ: Lawrence Erlbaum Associates, 1977.

Kintsch, W. & Greene, E. The role of culture-specific schemata in the comprehension and recall of stories. Discourse Processes, 1978, 1, 1-13.

Kintsch, W. and van Kijk, T.A. Toward a model of text comprehension and production. Psychological Review. 1978, 85, 363-394.

Kluwin, T., Getson, P., and Kluwin, B. The effect of experience on the discourse comprehension of deaf and hearing adolescents. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, 1978.

Knight, D.L. A general model of English language development in hearing-impaired children. Directions, 1979, 1, 9-28.

Knight, D.L. & Yekovich, F.R. Subjective story structure in hearing impaired adults. Paper presented at the annual meeting of the American Educational Research Association, Los Angeles, 1981.

Mandler, J.M. and Johnson, N.S. Remembrance of things parsed: story structure and recall. Cognitive Psychology, 1977, 9, 111-151.

Pollard-Gott, L., McCloskey, M. and Todres, A. Subjective story structure. Discourse Processes, 1979, 2, 251-281.

Stokoe, W. The study and use of sign language. Sign Language Studies, 1976, 10, 1-36.

Thorndyke, P.W. Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 1977, 9, 77-110.

TABLE 3.

Boy Story (Canonical)

1. There once was a little boy.
2. He lived in a very hot country.
3. One day his mother told him to take some cake to his grandmother who lived nearby.
4. She warned him to hold the cake very carefully so it would not break into crumbs.
5. The little boy wrapped the cake up in a leaf.
6. He tucked the cake under his arm.
7. He carried the cake to his grandmother's house.
8. When he got there the cake had all crumbled into pieces.
9. His grandmother told him he was a silly little boy.
10. She said that he should have carried the cake on top of his head so that it wouldn't break.
11. She gave him a pat of butter to take back to his mother's house.
12. The little boy wanted to be very careful with the butter.
13. He put the butter on his head.
14. He carried the butter home.
15. The sun was hot.
16. When he got home the butter was all melted.
17. His mother told him he a silly little boy.
18. She said that he should have wrapped the butter in a leaf so it would have gotten home safe and sound.

TABLE 4.

King Story (Canonical)

1. Once there was a king.
2. The king had three lovely daughters.
3. One day the three daughters went walking in the woods.
4. They were enjoying themselves very much.
5. They lost track of the time.
6. They stayed too long in the woods.
7. A dragon appeared.
8. He kidnapped the three daughters.
9. As they were being dragged off they cried for help.
10. Three heroes heard their cries.
11. They set off to rescue the daughters.
12. The heroes reached the scene.
13. They fought the dragon.
14. They killed the dragon.
15. They rescued the maidens.
16. The heroes returned the daughters safely to the palace.
17. The king heard of the rescue.
18. He rewarded the heroes.

TABLE 5.

Peter Story (Canonical)

1. This is a story about a boy.
2. His name is Peter.
3. He lived on a big farm.
4. One day Peter was playing in the yard.
5. The mailman drove up in his truck.
6. The mailman gave Peter the newspaper.
7. In the paper Peter saw a story about a circus.
8. Peter got very excited.
9. He had heard that circuses had trained lions.
10. He knew there were clown acts too.
11. Peter decided that he really wanted to go.
12. He packed a picnic lunch.
13. He started off for town.
14. He walked through the cow pasture.
15. He followed a path by a stream.
16. A couple hours later, Peter got to the circus.
17. The first thing Peter saw was the lion show.
18. Then he saw the clown act.
19. The clowns were squirting each other with water pistols.
20. Peter thought that the clowns were very funny.
21. He decided that the lion show was his favorite.
22. He thought that the lion tamer was very brave.
23. Peter was happy with everything he saw.